EXHIBIT CT120

Dr. William Trush: Rebuttal Testimony

Prepared on behalf of CalTrout for
State Water Resources Control Board Cachuma Project Hearing
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Steelhead population status and trends in the Santa Ynez River are inconsistent with the FEIR's conclusion that flows implemented under the National Marine Fisheries' Service 2000 Biological Opinion ("2000 BiOp") have resulted in increased abundance of *O. mykiss* in the lower Santa Ynez River (see e.g., FEIR, Vol. II at 4.7-24 and 4.7-25.)

Conclusion: Implementation of the 2000 BiOp has not produced an increase in anadromous adult *O. mykiss*. This conclusion is based on review and analysis of monitoring data updated since 2003.

Rationale: There are two recognized forms, or life history alternatives, of the trout *O. mykiss*: resident rainbow trout and anadromous steelhead. Oftentimes the distinction is not made, simply calling all trout and steelhead "*O. mykiss*," to avoid distinguishing the two forms where they overlap spatially (e.g., resident rainbows and juvenile steelhead living in the same tributary); distinguishing resident rainbows from juvenile steelhead in the field can be extremely difficult, if not impossible. In my testimony, however, I refer only to the anadromous form of *O. mykiss*, the sea-going steelhead, unless stating specifically otherwise. Oftentimes, the FEIR does not distinguish the two forms in reporting monitoring results or providing conclusions from the monitoring or scoring evaluation. In my evaluation of how well the 2000 NMFS BiOp has and might perform only increases and trends of the anadromous form of *O. mykiss* were considered relevant, because the ocean-run, anadromous steelhead – not resident trout - are the endangered, public trust resource that is at risk of extirpation due to continued operation of the Cachuma Project. This focuses my analysis primarily on the steelhead smolt outmigrant and adult steelhead trapping data.

The FEIR does not explain what the reported steelhead monitoring results mean and does not depict a steelhead population that is increasing. Without some quantitative strategy for valuing smolt production (i.e., how many adult steelhead return from a cohort of out-migrating smolts), the

significance of the monitoring results cannot be adequately assessed relative to the FEIR's conclusion that streamflows implemented under the 2000 BiOp have resulted in increased abundance of *O. mykiss* in the lower Santa Ynez River. In particular, the FEIR does not consider or address the question of how many anadromous adult *O. mykiss* would be expected to return to the Santa Ynez River directly from the smolts trapped during the annual monitoring, which is reported in FEIR, Vol. II, Appendix G., Figure 2. The number of returning adult *O. mykiss* is critical to determining whether a steelhead population is increasing, because without increased future adult steelhead migration runs, the collective juvenile rearing potential of the remaining tributaries below Bradbury Dam would be limited by too few eggs. In other words, the total outmigration of approximately 220 smolts from Hilton Creek in WY2006, (the monitored year with the highest reported smolt production) may appear considerable until put into context of the likely number of returning anadromous adult *O. mykiss*. The appropriate question to ask to determine whether flows implemented under the 2000 BiOp have resulted in increased abundance of *O. mykiss*, is, how many anadromous adult *O. mykiss* would be expected to return from Hilton Creek's 220 smolts?

Smolt-to-Adult Return (SAR) curves are essential to assessing population response trends from annual smolt monitoring results. For example, an SAR curve has been instrumental in evaluating alternative instream flow strategies for anadromous *O. mykiss* in the Alameda Creek basin (Atkinson et al. 2011). A steelhead smolt's chance of returning as an adult (i.e., 'succeeding') is strongly a function of its size upon entering the Pacific Ocean – i.e., bigger steelhead smolts entering the Pacific Ocean have a better chance of returning to freshwater as an adult than do smaller smolts (Bond et al. 2008; Boughton et al. 2009; Hayes et al. 2008; McBain and Trush 2008). As explained below, an SAR curve predicts the chance of adult return as a function of smolt size.

During my dissertation fieldwork, I developed an SAR curve, (presented in Atkinson et al. 2011) that has been modified to include an upper and lower range in smolt-to-adult return (Figure 1) because of the expected inter-annual variability from many environmental factors, including fluctuations in ocean productivity. Steelhead juvenile/smolt size generally is measured by fork length (FL). An FL = 150 mm has been adopted as the tipping point for desired smolt success (Atkinson et al. 2011), a length slightly longer than a

mechanical pencil with a new eraser (approximately 145 mm). A 150 mm smolt has an SAR of 0.3% to 0.6% (Figure 1). The SAR curve is particularly non-linear over a narrow FL range typical of outmigrating smolts; small changes in smolt FL greatly affect adult return. A smolt with a FL = 175 mm has an SAR of 2.0% to 3.0%. This SAR is an order of magnitude increase (over the SAR of a 150 mm smolt) for only a 25 mm increase in smolt FL. Smolt monitoring results, therefore, should provide the lengths of smolts captured (as was done in 2008 and 2009 Annual Reports) so that a better overall SAR estimate can be computed for an entire outmigrant smolt population.

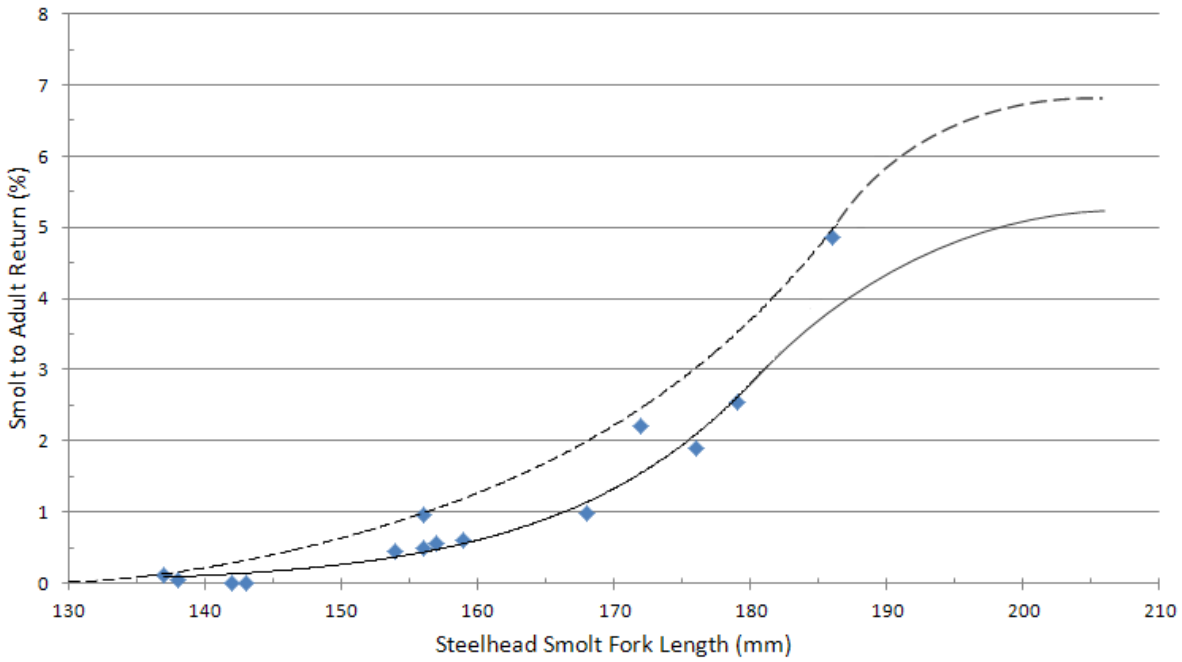

Figure 1. Upper and lower steelhead smolt-to-adult return curves.

To estimate adult return from the 220 smolts leaving Hilton Creek in WY2006 and directly entering Pacific Ocean, the smolt's size class distribution is needed to make the best estimate possible. A size class distribution (SCD) is comprised of smolts belonging to discrete size classes, generally in 10 mm increments. To estimate adult return, multiply the number of smolts in each size class by the appropriate predicted smolt-to-adult return survival (%) from the SAR curve (Atkinson et al. 2011).

Although smolt FLs were measured, the FEIR only presents these data in three broad size categories (Appendix G, Tables 3 to 8: Tributary upstream and downstream migrant captures for Hilton and Salsipuedes Creek, WYs 2005 to 2010); most smolts trapped were assigned to a single 101 mm – to - 199 mm size class. If all 220 smolts were 175 mm long (very unlikely, but taking a conservatively high approach by using a large smolt size) the predicted adult return is 4 to 5 adult steelhead (0.02 adults/smolt * 220 smolts = 4.4 adults). Using the upper SAR curve in Figure 1 to predict adult return, a 175 mm smolt would have a 3.0% chance of returning as an adult. For 220 smolts, this 3.0% chance predicts a return of 6 to 7 returning adults (0.03 adults/smolt * 220 smolts = 6.6 adults). For Hilton Creek, perennial streamflows implemented under the 2000 BiOp have increased smolt production, but this has not translated into a measurable increase in returning adult *O. mykiss*. Other monitored years had substantially fewer smolts leaving Hilton Creek, and therefore would be expected to result in fewer returning adults than estimated for the WY2006 smolt production. The SAR curve used in this exercise is appropriate for Hilton Creek and the Santa Ynez River because when applied to the number of Hilton Creek (and basin-wide) outmigrating smolts, the SAR curve results in adult run sizes similar to those observed through Cachuma's trapping effort in Hilton Creek and the Lower Santa Ynez River. The number of adults captured since WY2001 corroborates the SAR curve applied in this exercise.

There was no positive trend to smolt production in Salsipuedes Creek (FEIR, Vol. II, Appendix G, Figure 2: Number of smolts captures in WY2000 to the present at the three trapping locations within the Lower Santa Ynez River). WY2006 also produced the most smolts (n=210 smolts) monitored in Salsipuedes Creek (FEIR, Appendix G). Using the upper SAR curve and a smolt size of 175 mm for all 210 smolts, smolt production in WY2006 would be expected to return 6 to 7 adults (0.03 adults/smolt * 210 smolts = 6.3 adults). Other monitored years had substantially fewer smolts leaving Salsipuedes Creek, and therefore would be expected to result in fewer returning adults than estimated for the WY2006 smolt production. Since WY2006, smolt numbers have not increased.

Table ES-2 in the 2009 Monitoring Report (p. iii, Bureau of Reclamation 2012) sums up the total annual smolts trapped at all stations from WY2001

to WY2009. Predicted totals of returning adults (using all smolts 175 mm long with an SAR of 3.0%) ranged from a low of 0.72 adults in WY2002 to a high of 13.1 adults in WY2006, with no discernible trend over the WY2001 to WY2009 annual smolt totals.

Although the FEIR Appendix G did not provide sufficient resolution in the size class distribution for outmigrating steelhead smolts leaving Hilton or Salsipuedes creeks, the 2008 and 2009 Monitoring Reports do (Bureau of Reclamation 2011 and 2012). Table 31b (p.77) for WY2008 provides the size class distribution of downstream migrants in 10 mm increments for Hilton Creek in WY2008. I assumed all trapped fish between 100 mm and 269 mm were pre-smolts or smolts, making my adult return estimate conservatively high. Applying only the upper SAR curve to the number of 'smolts' in each 10 mm increment (n=189 Hilton Creek smolts), I estimated an adult return of 2.9 adults.

Doing a similar analysis for Salsipuedes Creek in WY2008 (from Figure 35b, p.81 in Bureau of Reclamation 2011), I estimated a 2.7 adult return from the WY2008 smolt production. Without a smolt size class distribution (e.g., annual smolt production reported in Appendix G) and assuming all smolts were 175 mm long, the predicted adult return was 5 to 6 adults (0.03 adults/smolt * 189 smolts = 5.7 adults). By accounting for the size class distribution in smolt size provided in the 2008 Annual Report, the estimated adult return in Salsipuedes Creek was reduced by approximately half (i.e., 2.7 adults compared to 5.7 adults).

In WY2009 (Bureau of Reclamation 2012), smolts leaving Hilton Creek (using the procedure as in WY2008) produced an estimated 2.7 adults, close to the WY2008 adult estimate of 2.9 adults. However, Salsipuedes Creek smolt output in WY2009 was markedly down from the WY2008 total, producing an estimated 0.56 adults in WY2009 (compared to 2.7 adults in WY2008).

My findings from applying the SAR curve to the smolt numbers and sizes in Hilton Creek, the mainstem and Salsipuedes Creek are generally consistent with monitored results for the low numbers of returning adults, indicating that the SAR curve is appropriate for the current situation on the Santa Ynez River.

Based on the data presented, smolt production in the Lower Santa Ynez River under the BiOp reached a high in WY2006, signaling the highest potential for adult returns. Smolt production and associated potential for contributing to adult returns has not been increasing since WY2006.Based on these SAR analyses of steelhead smolt trapping data from WY 2001-2009, using size class distributions for WY2008 and WY2009 smolt output, or alternatively, assuming all smolts were 175 mm, there would be no measurable increase in adult steelhead return. Without a measurable increase in the predicted or observed adult run size for the lower Santa Ynez River, the FEIR cannot conclude that flows implemented under the 2000 BiOp have resulted in increased abundance of steelhead, the sea-going life history alternative of *O. mykiss,* in the lower Santa Ynez River, and it is misleading for the FEIR to state that *O. mykiss* have increased in abundance.

Steelhead population status and trends in the Santa Ynez River are inconsistent with the FEIR's conclusion that flows implemented under the 2000 BiOp will support the continued survival of steelhead in the Santa Ynez River. (see, e.g., FEIR, Vol. II at 4.7-26.)

Conclusion: Review and analysis of monitoring data, updated since 2003, demonstrates that flows implemented under the 2000 BiOp, if applied into the future, will threaten the survival of the Santa Ynez River steelhead population.

Rationale: For continued survival, a minimum number of returning adults – considerably larger than the adult steelhead population today - will be needed to sufficiently populate the tributaries with enough eggs to fulfill the smolt rearing potential of fish-bearing tributaries below Bradbury Dam. In addition, being at the extreme end of their range, the Santa Ynez River steelhead will need to take advantage of every opportunity favoring their survival, beginning with producing as many smolts as their environment allows as an insurance policy against catastrophic and incremental change (National Marine Fisheries Service 2012). NMFS's estimated viable population size for the Santa Ynez River, an adult run size of 4,150 adults avoiding a 5% chance of extirpation in the next 100 years, greatly exceeds total annual adult returns from WY2000 through WY2008. Based on these considerations today's population is at heightened risk of decreasing in the future.

The FEIR describes that the 2000 BiOp target flows of 2.5 cfs to 5.0 cfs have been maintained yearly for the last 10 years. (FEIR, Vol. II 2.0-29: "*The Biological Opinion recognizes this yearly variability, and baseflow targets are designed to take advantage of the "boom" years by extending flow following spill events as well as maintaining suitable aquatic habitat by target flows of 2.5-5.0 cfs, which have been maintained yearly since 2000 in compliance with the Biological Opinion at Highway 154.*"). Yet, there has been no positive trend in adult return at the three trapping sites between WY2000 and WY2010 (FEIR, Vol. II, Appendix G, Figure 3: Number of anadromous adult captures in WY2000 to the present at the three trapping locations within the Lower Santa Ynez River.).

There has also been no positive trend in smolt production at the Lower Santa Ynez River mainstem and Salsipuedes Creek trapping locations (FEIR, Vol. II, Appendix G, Figure 2: Number of smolts captures in WY2000 to the present at the three trapping locations within the Lower Santa Ynez River.). Larger smolts are needed to produce more adults. As demonstrated previously, smolt production over the last 10 years is not translating to a measurable increase in adult *O. mykiss*. I found no supporting evidence in the FEIR or 2000 BiOp to expect significantly improved annual adult runs at these trapping locations over the next 10 years. Fish passage projects mandated in the 2000 BiOp ultimately may lead to the production of more smolts, but even these projects under the best circumstances, will not be enough because they (1) provide enhanced (not new) access for steelhead, and (2) open up relatively few miles of habitat. The three current sampling locations[1] are sufficient to collectively signal whether the BiOp provisions are adequate to support a positive trend of significant smolt production. Only Hilton Creek's transformation to a perennial channel resulted in a positive trend of smolt production. However, as demonstrated in the prior section of this testimony, the increase in Hilton Creek smolts, which reached a high in WY2006, is capable of producing only a few returning adults. Larger smolts are needed to produce more adults, but there is no reasonable basis to expect this to occur under the provisions of the 2000 BiOp given the outcomes from the last 10 years.

Moreover, there is a limit to how much Hilton Creek can contribute to basinwide adult return. If perennial streamflows were augmented even more in Hilton Creek, eventually a habitat carrying-capacity for juvenile rearing would be achieved as well as the size class distribution for juveniles/smolts

[1] one located in the biggest tributary downstream from Bradbury Dam (Salsipuedes Creek), one located in a continually watered tributary (Hilton Creek), and another on the mainstem

leaving Hilton Creek. The FEIR's conclusion regarding improved annual smolt production (Appendix G, Figure 2) is based entirely on Hilton Creek (p.27, Bureau of Reclamation 2012). However, annual smolt production from Hilton Creek cannot continue to increase indefinitely. A few more years of monitoring would be warranted, but Hilton Creek may be approaching its annual capacity for smolt production. Salsipuedes Creek, without flow augmentation, would be expected to fluctuate seasonally depending on annual streamflows.

More smolts, and larger smolts, are needed to produce more adults, but there is no reasonable basis to expect this to occur under the provisions of the 2000 BiOp given the outcomes from the last 10 years. As a reference point and compelling reason for concern, NMFS's estimated minimum viable population size for the Santa Ynez River is an adult run size of 4,150 adults to avoid a 5% chance of extirpation in the next 100 years; contemporary adult steelhead run size is less than .4% of this minimum. Based on these considerations, today's steelhead population is at heightened risk of future decline and extirpation.

The monitoring data, therefore, do not support the FEIR's presumption that the 2000 BiOp supports continued population survival.

Steelhead population status and trends in the Santa Ynez River are inconsistent with the FEIR's conclusion that flows required by the 2000 BiOp will protect *O. mykiss* as a public trust resource.

Conclusion: Review and analysis of data, updated since 2003, demonstrates that the 2000 BiOp is not adequate to protect public trust.

Rationale: The FEIR concludes that "SWRCB is of the opinion that the public trust resource would be protected under the implementation of the proposed project" because it incorporates the requirements of the 2000 BiOp. (FEIR, Vol. 1 at 2.0-66; and also, e.g., at 2.0-108, 2.0-112.). This is an assumption, and not a conclusion based on quantitative analyses of the monitoring results. Earlier in my testimony I stated that: (1) the FEIR data show that implementation of the 2000 BiOp over the last decade has not increased the abundance of anadromous adult *O. mykiss* in the Santa Ynez River and (2) an analysis of the FEIR data shows that implementation of the 2000 BiOp into the future will not increase the present-day, low abundance of anadromous adult *O. mykiss* and consequently will threaten their

continued survival. Under these circumstances, there is no basis for expecting that the public trust can be protected by the 2000 BiOp.

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